FINGERPRINT PATTERNS IN WAINWRIGHT ESKIMOS

Robert J. Meier
Indiana University

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INDIANA UNIVERSITY

Introduction

Wainwright is an Alaskan Eskimo village located on the northwestern coast some 90 air miles southwest of Pt. Barrow. Seasonal habitation of the village was the residence pattern until the early 1900s when a school house and some attendant services were established there. The village was settled by migratory hunting and fishing bands whose history can be traced to both coastal and interior areas stretching across the northwest region of Alaska. As a consequence, the contemporary Wainwright population is derived from a once widely dispersed yet interbreeding source of Eskimos. The nomadic bands had maintained continual, intermittent trading and visiting contacts, and also had established reciprocal cross-band marriage alliances (Milan, n.d., p. 5). This kind of historical mating system would serve to define roughly the boundaries of a rather large and diffuse breeding community of northwestern Alaskan Eskimos.

Non-Eskimo sources have also contributed to the gene pool of the present population at Wainwright. Genetic admixture, stemming from various Caucasian elements, dates to the late 19th century when commercial whaling vessels made contacts with coastal

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villages. According to a recently completed genealogical analysis, approximately one-fifth of the 308 native residents of Wainwright in 1968 were known to have non-Eskimo ancestry (Milan, n.d., p. 5). Although the degree of hybridization differed between individuals, the great majority were second and third generation descendants of Eskimo-white matings. Possible effects of hybridization on the dermatoglyphic results will be discussed later on in the report.

A five-year research investigation at Wainwright was begun in 1968 under the auspices of the International Biological Program. A central aim of the study, which also involves multidisciplinary teams who are conducting research in Canadian and Greenlandic Eskimos, is to investigate biological and behavioral processes underlying the successful adaptation and slow population growth of Eskimos inhabiting the arctic and sub-arctic environments (Milan, 1968, p. 123). In conjunction with the IBP study and included as part of the genetic and anthropometric investigation, dermatoglyphic collections were made in Wainwright during July, 1969. The apical prints have been analyzed and the results form the basis of this report.

Methods

Dermatoglyphic prints were collected, using Faurot and Hollister materials, from 97 males and 112 females of all age groups. The total of 209 persons included roughly 70% of individuals available for study in the village.

Fingerprint pattern types were defined on the basis of

ridge count and categorized into arches, radial and ulnar loops, and whorls. Pattern intensity was calculated according to the method described in Cummins and Midlo (1961, p. 71) and ridge counting followed the procedures set forth by Holt (1961, p. 88).

Since no attempt was made to eliminate family members from the collection, it should be noted that a high degree of genealogical relatedness is characteristic of the sample. To illustrate this point, some 50 nuclear family units were represented and 21 of these contributed five or more family members to the sample. A more precise indicator of the amount of interrelatedness within the Wainwright population was provided by Milan (n.d., Table 1, p. 21) who calculated that individuals of the parental generation were on the average related to a degree equivalent to that of second cousins once removed. (Coefficient of Relationship was R=0.0144 as compared with R=0.0156 for second cousins once removed).

Preliminary attempts were made to discover what effect the inclusion of family members had upon the dermatoglyphic results. In one instance, tabulations of pattern types were made for each family unit. This approach appeared to offer some suggestions. When frequency data from family units of five or more members were analyzed separately, their pattern type distribution was found to have higher percentages of ulnar loops and arches and a corresponding lower incidence of whorls. The tendency for larger families to have fewer whorls but more loops and arches than smaller sized families could

very well account for some of the peculiarities found in the Wainwright results. It seems fairly certain that the Wainwright sample is representative of the village population but whether it also reflects the dermatoglyphic picture of northwestern Alaskan Eskimos in general is very much an open question. This matter will be returned to shortly.

Results

Digit and bimanuar distributions of pattern types are given in Table 2. These results can be summarized by stating that with few exceptions the differential occurrence of patterns when tabulated by digit and hand was not appreciably different from that found in a large British series reported in Cummins and Midlo (1961, pp. 67-70). One exception was present in Wainwright males who instead of having ulnar loops as the most frequently occurring pattern on every digit, had whorls as the predominant pattern of the first digit of the right hand. A second exception occurred in both sexes, but was decidely more pronounced in females, in which radial loops were observed more often on the left hand rather than on the right as was the case for the British series. Agreement between the British and Wainwright results obtained from such bimanuar distributions as a preponderance of arches and ulnar loops on the left hand, and a higher proportion of whorls on the right hand.

Table 3 reports the total pattern type frequencies for each sex separately. Males and females were found to differ

TABLE 2

nt distribution of pattern types in Wainwright ma[illegible]

<u>Males (N=97)</u>

igit	Arches	Radial Loops	Ulnar Loops	Whorls
R	-	-	44.3	55.7
L	5.2	1.0	57.3	36.5
R and L	2.6	0.5	50.8	46.1
R	6.3	21.9	54.2	17.7
L	6.2	21.6	55.7	16.5
R and L	6.2	21.8	54.9	17.[illegible]
R	1.0	1.0	84.5	13.4
L	3.1	1.0	82.5	13.4
R and L	2.1	1.0	83.5	13.4
R	2.1	1.0	52.6	44.3
L	2.1	1.0	57.7	39.2
R and L	2.1	1.0	55.2	41.8
R	1.0	-	81.3	17.7
L	2.1	-	84.5	13.4
R and L	1.6	-	82.9	15.5
R	2.1	4.8	63.4	29.8
L	3.7	5.0	67.6	23.8
R and L	2.9	4.9	65.5	26.8

<u>Females (N=112)</u>

igit	Arches	Radial Loops	Ulnar Loops	Whorls
R	1.8	-	58.9	39.3
L	5.4	-	71.4	23.2
R and L	3.6	-	65.2	31.3
R	11.6	8.0	64.3	16.1
L	15.2	15.2	50.0	19.6
R and L	13.4	11.6	57.1	17.9
R	5.4	-	86.6	8.0
L	3.6	2.7	78.6	15.2
R and L	4.5	1.3	82.6	11.6
R	2.7	1.8	62.5	33.0
L	3.6	2.7	67.0	26.8
R and L	3.1	2.2	64.7	29.9
R	6.3	-	83.0	10.7
L	5.[illegible]	-	84.8	9.8
R and L	5.[illegible]	-	83.9	10.3
R	5.[illegible]	2.0	71.1	21.4
L	6.[illegible]	[illegible]	70.4	18.9
R and L	6.[illegible]	3.0	70.7	20.2

Table 3

Percent Frequency of Pattern Types
in Wainwright Eskimo Males and Females

	No. of Prints	Arches	Radial Loops	Ulnar Loops	Whorls
Males	967	2.9	4.9	65.5	26.8
Females	1120	6.1	3.0	70.7	20.2

Chi-square value - 27.7 [a]

a Significant at less than 0.005 level.

Table 4

Mean Pattern Intensity(PI) and Mean Total Ridge Count(TRC)
in Wainwright Eskimo Males and Females

	No. of Persons	PI	S.D.	TRC	S.D.
Males	94	12.4	3.8	117.5	43.4
Females	112	11.4	3.2	104.6	42.9
t value		1.5		2.1 [b]	

b Significant at .05 level.

significantly in their pattern distributions at a very low probability value, i.e., less than 0.005. Variation between the sexes was due to males having higher percentages of whorls and radial loops while females had greater proportions of ulnar loops and arches. These findings are generally representative of sexual dimorphism as expressed in fingerprint patterns throughout most groups, including Eskimos.

Corresponding to the above sex differences observed in pattern type distribution, and then mainly due to differential frequencies of whorls, results for pattern intensity and total ridge count also distinguished between Wainwright males and females. These results are given in Table 4. In the case of pattern intensity, the mean value for males (12.4) was one unit higher than that recorded in females (11.4). This difference failed to reach significance at the 5% level. However, in terms of total ridge count, males had a significantly higher mean (117.5 ridges) than females (104.5 ridges). On the average, Wainwright males had very nearly 13 more ridges per individual. Males ordinarily do have higher ridge counts than females but the difference does not always attain statistical significance. Cases of this nature are illustrated by a British series (Holt, 1949) and an Indian sample (Mavalwala, 1963). Two Eskimo series, one from Kodiak Is. (Meier, 1966) and the other from West Greenland (Cummins and Fabricius-Hansen, 1946) also showed insignificant sex differences and in both of these instances females had slightly higher mean total ridge counts than males.

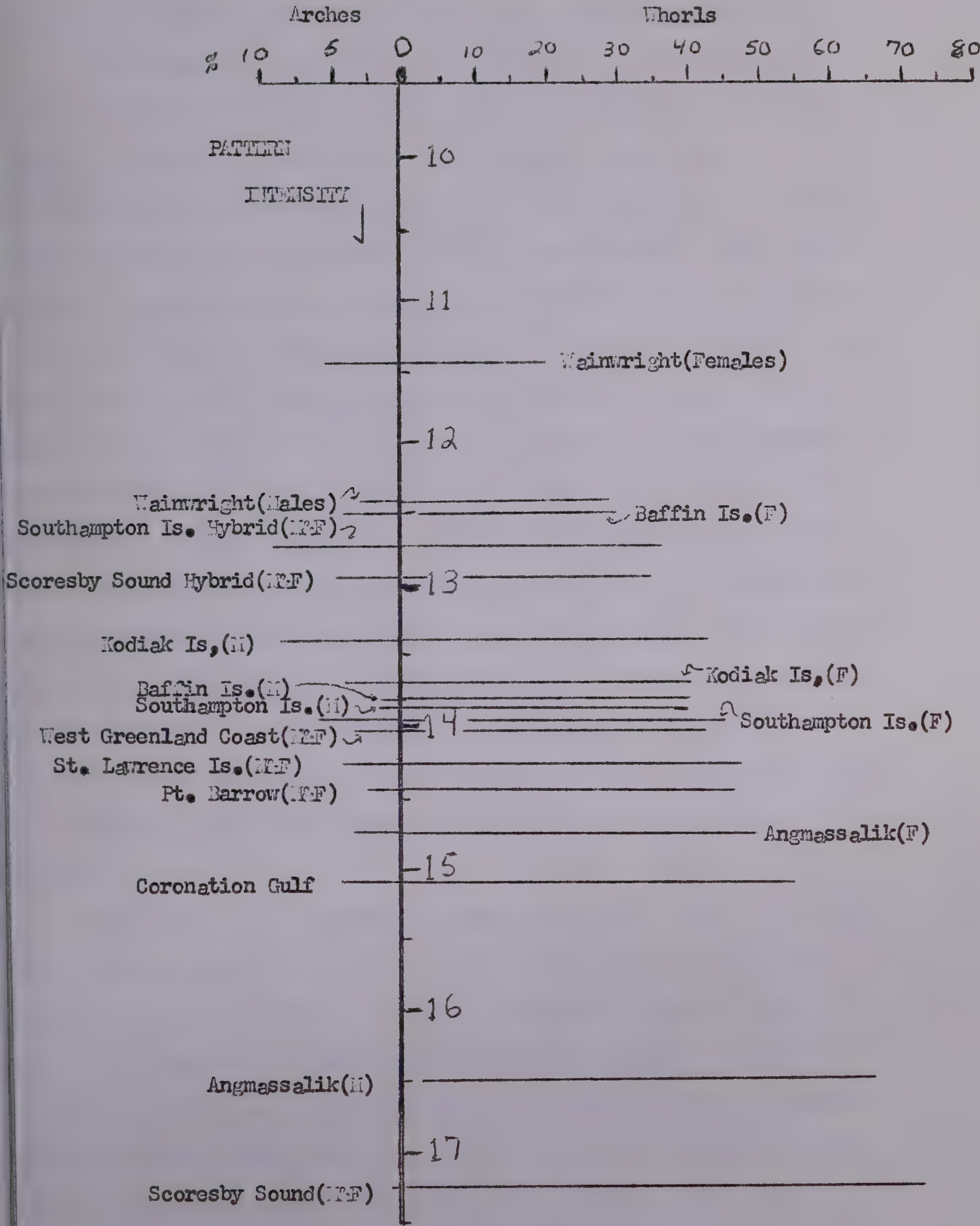
In an attempt to place the Wainwright results within a comparative context of Eskimo dermatoglyphics, Figure 1 was prepared which shows the percent frequency of arches and whorls in several series arranged according to increasing pattern intensity. Published data for Eskimo finger dermatoglyphics have included some nine groups extending from the Angmassalik on the east coast of Greenland west to the St. Lawrence Islanders of northern Bering Sea. This roughly 3000-mile linear expanse of Eskimoland is being filled out continually with recently completed and proposed dermatoglyphic studies of northern peoples. For example, prints have already been collected from two additional points on Greenland, these being Upernivik and Smith Sound.

The Wainwright results can be seen to contrast from other Eskimos in the following manner. Due to an infrequent number of whorls, pattern intensity was comparatively low. Hence, the Wainwright Eskimo fell some distance away from most of the remaining Eskimo series. This distance, in terms of pattern intensity, amounts to somewhat less than one unit to more than three units separation between Wainwright and other Eskimos. In terms of whorl pattern frequency, Wainwrighters had about one-half the percentage found in several Eskimo groups.

A partial explanation for these findings is suggested by the proximity to Wainwright of two Eskimo-white hybrid samples from Southampton Is. and Scoresby Sound. In both of these samples whorl frequency and accompanying pattern intensity are reduced in comparison with non-admixed samples from within

Figure 1

Percent Frequency of Arches and Whorls in Eskimos, Arranged According to Increasing Pattern Intensity



their respective areas. Presumably, these reductions are ultimately attributable to gene flow from European sources.

Following the suggestion offered in the Eskimo hybrid data, the Wainwright sample was partitioned according to admixture status and analyzed. The results are given in Table 5. When all known persons having non-Eskimo ancestry (which amounted to about one-fourth of the total sample) were tested against the remainder, pattern type distribution was not found to differ significantly in either sex. Of some interest, however, was the information that the difference between the admixed and non-admixed sub-samples was toward an anticipated direction whereby gene flow would be expected to reduce the frequency of whorl patterns. Thus admixed males and females from Wainwright had about 5% fewer whorls (and a one-half unit smaller pattern intensity value) as compared with the remaining portion of the sample. A question which does arise is whether this remainder has been thoroughly screened of non-Eskimo ancestry? At this time, it can only be said that the possibility of undetected admixture does exist (Jamison, personal communication).

Wainwright also showed a marked contrast from two of the three Eskimo groups for which quantitative values or ridge-counting data have been reported. This difference would appear to be partially explainable on the basis of an interrelatedness between pattern type and pattern size, as approximated through ridge counting. That is, whorls tend to have more ridges than loops (see Holt, 1961; Meier, 1966) and arches, by definition, have a zero ridge count. In accordance

TABLE 5

[Per]cent Frequency of Pattern Types and Mean Pattern Intensity (PI) for Admixed and Non-admixed Wainwright Males and Females

	No. of Prints	Arches	Radial Loops	Ulnar Loops	Whorls	PI
[Ma]les						
[N]on-admixed	737	2.9	5.4	63.9	27.8	12.5
[A]dmixed	230	3.0	3.0	70.4	23.5	12.0
	Chi-square=4.4, 0.25>p>0.20					
[Fem]ales						
[N]on-admixed	810	6.4	3.2	68.8	21.6	11.6
[A]dmixed	310	5.2	2.6	75.8	16.5	11.1
	Chi-square=5.3, o.15>p>0.10					

vith this relationship, the West Greenland (Cummins and 'abricius-Hansen, 1946) and Pt. Barrow (Cummins, 1935) Eskimos ıad whorl frequencies exceeding 40% and their respective mean otal ridge counts for the sexes combined were 149.8 and 157 idges. For comparison, these mean values are between 27% and 0% higher, and the whorl frequencies are between 15% to 25% reater than corresponding Wainwright figures. In the third roup of Eskimos, from Kodiak Is. (Meier, 1966), the occurence of whorls was also more than 40% but mean total ridge ount was 120.8 ridges in males and 122.3 ridges in females. n this case, a high frequency of arches in the group tended o cancel out the contribution of whorl ridge counts and a ather low mean total ridge count was the result. For Wainright, the comparatively low mean total ridge count is acounted for by a low whorl frequency combined with high proortions of loops and arches.

iscussion

In pattern type frequencies and in related dermatoglyphic raits the Wainwright Eskimo was found to vary substantially rom other Eskimos. Briefly stated, the Wainwrighters were haracterized by a low frequency of whorls, and correspondingly ow pattern intensity and total ridge count. In part, this istinctiveness can be assigned to the effects of gene flow rom non-Eskimo sources whereby loop patterns were increased t the expense of whorls.

A second, and probably more important source of the de-

viation, appears attributable to a high concentration of family members in the sample. There was a clear tendency for larger sized families to add high proportions of ulnar loops and arches to the total series. This kind of sample bias, i.e., a high degree of relatedness between individuals within a sample, has been offered in explanation of results for an East Greenland group from Scoresby Sound (Cummins and Midlo, 1961, pp. 258-259). The East Greenland Eskimo, however, deviated from other Eskimos in an opposite direction from that observed in Wainwright. The East Greenlanders are noteworthy for having a very high percentage of whorls; 72.2% of all patterns were of this type.

Inbreeding effects resulting from interrelatedness of individuals at Wainwright is a third possibility to be considered. If the more simple fingerprint pattern types, e.g., arches, are recessively inherited, then an increase in homozygosity due to inbreeding would result in greater frequencies of these types and lead to decreases in pattern intensity and total ridge count. In this connection, a Peruvian Cashinahua series (Jantz, et. al., 1969) perhaps showed these inbreeding effects in their dermatoglyphic pattern distribution.

Finally, there is another consideration worthy of mention. As noted in the Introduction, the historical mating system of northwestern Alaskan Eskimos involved mate exchange between highly nomadic hunting and fishing bands. This structuring of small groups within a larger breeding community would have served to integrate the gene pool over time. Subsequently,

upon settling into villages such as at Wainwright, founding members might not have been representative of dermatoglyphic variability then present in northwestern Alaska. Depending upon the degree of breeding isolation these settled villages experienced in succeeding generations, greater or lesser departures from each other would have ensued. Using this argument it could be offered that Wainwright does not faithfully depict the dermatoglyphic picture of northwestern Alaskan Eskimos, or for that matter, Eskimos in general.

An alternative argument would be that Wainwright has in fact remained fairly representative of its ancestral sources. This would then mean that the northwestern region of Alaska differs substantially in its dermatoglyphics from other Eskimo regions. Additional studies, some of which are planned for the very near future, obviously are needed to help settle this question.

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